MMP14 gene

matrix metallopeptidase 14

Normal Function

The *MMP14* gene (also known as *MT1-MMP*) provides instructions for making an enzyme called matrix metallopeptidase 14. This enzyme is found on the surface of many types of cells. It normally helps modify and break down various components of the extracellular matrix, which is the intricate lattice of proteins and other molecules that forms in the spaces between cells. These changes influence many cell activities and functions. For example, they have been shown to promote cell growth, stimulate cell movement (migration), and trigger the formation of new blood vessels (angiogenesis).

Matrix metallopeptidase 14 also turns on (activates) a protein called matrix metallopeptidase 2 in the extracellular matrix. The activity of matrix metallopeptidase 2 appears to be important for a variety of body functions, including bone remodeling, which is a normal process in which old bone is broken down and new bone is created to replace it.

Although most research has focused on the role of matrix metallopeptidase 14 in the extracellular matrix, studies suggest that it may also be involved in signaling pathways within cells. Little is known about this function of the enzyme.

Health Conditions Related to Genetic Changes

Winchester syndrome

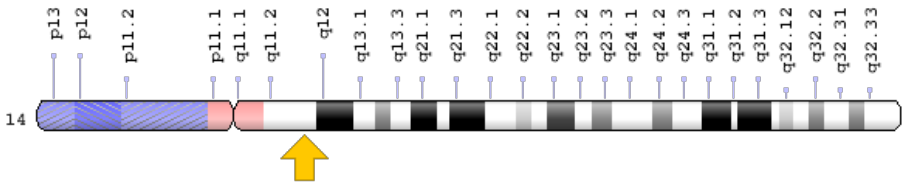
At least one mutation in the *MMP14* gene has been found to cause Winchester syndrome, a rare inherited bone disease that is characterized by a loss of bone tissue (osteolysis), particularly in the hands and feet, as well as joint and skin abnormalities. The mutation changes a single protein building block (amino acid) in matrix metallopeptidase 14. Specifically, it replaces the amino acid threonine with the amino acid arginine at position 17 (written as Thr17Arg or T17R).

The identified mutation alters matrix metallopeptidase 14 so that less of the enzyme is able to reach the cell surface. As a result, not enough of the enzyme is available to break down components of the extracellular matrix and activate matrix metallopeptidase 2. It is unclear how a shortage of this enzyme leads to the signs and symptoms of Winchester syndrome. It is possible that a loss of matrix metallopeptidase 2 activation somehow disrupts the balance of new bone creation and the breakdown of existing bone during bone remodeling, causing a progressive loss of bone tissue. How a reduced amount of matrix metallopeptidase 14 leads to the other features of Winchester syndrome is unknown.

Chromosomal Location

Cytogenetic Location: 14q11.2, which is the long (q) arm of chromosome 14 at position 11.2

Molecular Location: base pairs 22,836,533 to 22,847,600 on chromosome 14 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- matrix metallopeptidase 14 (membrane-inserted)
- matrix metalloproteinase-14
- matrix metalloproteinase-14 preproprotein
- membrane-type-1 matrix metalloproteinase
- membrane type 1 metalloprotease
- MMP-14
- MMP-X1
- MMP14_HUMAN
- MT-MMP
- MT-MMP 1
- MT1-MMP
- MT1MMP
- MTMMP1
- WNCHRS

Additional Information & Resources

Educational Resources

- Molecular Biology of the Cell (fourth edition, 2002): The Extracellular Matrix of Animals
  https://www.ncbi.nlm.nih.gov/books/NBK26810/

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28MMP14%5BTI%5D%29+OR+%28MT1-MMP%5BTI%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

OMIM

- MATRIX METALLOPROTEINASE 14
  http://omim.org/entry/600754

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/MMP14ID41391ch14q11.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=MMP14%5Bgene%5D
- HGNC Gene Family: Matrix metallopeptidases
  http://www.genenames.org/cgi-bin/genefamilies/set/891
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=7160
- MEROPS Peptidase Database
  http://merops.sanger.ac.uk/cgi-bin/pepsum?mid=m10.014
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/4323
- UniProt
  http://www.uniprot.org/uniprot/P50281

Sources for This Summary

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